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to which it refers has been changed from its original character through devitrification.

Mica-Syenites at Rothschonberg.—Two dykes of mica-syenite cut the phyllite formation near Rothschönberg, Saxony, producing in the neighboring rocks contact metamorphism. One of the dykes weathers spheroidally, and in the kernels of the spheroids fresh material for study was afforded Henderson,[5] who found the rock to be composed of orthoclase, plagioclase, quartz, biotite, apatite and several accessory components. The feldspar and quartz both occur in grains and in crystals, the biotite in flakes. An analysis of the rock gave the figures below (I).

The second occurrence differs little from the first. Muscovite is present as well as biotite, otherwise the two rocks are practically alike in mineral composition. Its chemical composition is shown in (II).

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	H_2O	CO_2	S	Total
I.	61.40	16.66	7.46	2.08	3.65	2.93	4.75	.76	1.54	.20	=101.43
II.	57.63	16.47	5.37	5.25	4.44	3.12	5.15	.45	2.14	.95	=100.97

The structure of both rocks was panidiomorphic, although the development of secondary quartz renders them now hypidiomorphic. They are syenitic aplites. In the neighboring phyllites new biotite has been abundantly developed and hornblende has been produced in some quantity. The free silica which is abundant in the unaltered phyllites has become combined with metallic elements in the altered forms. While the percentage of silica in specimens taken at 2 meters and 11 meters from the contact and at the contact is the same, the free quartz in the first is 43.38 per cent of the rock's mass, in the second 38.94 per cent and in the third 34.06 per cent.

GEOLOGY AND PALEONTOLOGY.

Cambrian Rocks of Pennsylvania.—During the years 1892 and '93, Mr. Walcott made an examination of the rocks of Cambrian southeastern Pennsylvania for the purpose of determining whether the lower quartzites with their superjacent limestones were of the same geologic age, in the areas included between the Potomac and Susquehanna and the Delaware and Susquehanna Rivers. The results of his work are published in bulletin form by the U. S. Geological Survey.

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[5] Zeits. d. geol. Ges., XLVII, p. 534.

Mr. Walcott began the investigation in York County, where he determined the stratigraphic position of the Chickies quartzites and the York shales which are subjacent to the Lancaster (York Frazer) limestone. Paleontologic evidence shows them to be of Lower Cambrian age. The fauna of the main body of the limestone of York County, as shown by collections from three separate localities, is Cambrian. These localities indicate respectively, an Upper Olenellus zone, a horizon between the Lower and Middle Cambrian, and a lower horizon of the Middle Cambrian.

The discovery of Lower Cambrian fossils in the compressed syncline of limestone in Lancaster County, south of Columbia, indicates that the limestone on the west side of the river is of the same geologic age, and that the shales and schists beneath it are of Lower Cambrian age.

Mr. Walcott states that in York County there is no sedimentary rock other than the mesozoic new red sandstone—of later age than the Cambrian, unless it be the Peach Bottom slates and chlorite-schists of the southeastern corner of the country. He also thinks it probable from the closely related structure of Lancaster County that all the Lancaster limestones will fall within the Cambrian, unless it be some portions of the upper series, which may pass into the Ordovician. He applies this generalization to the entire extension of this series of limestone northeastward to the Delaware.

All of the quartzites that have been referred to the Potsdam necessarily fall into the Lower Cambrian, as they are beneath the limestones.

The South Mountain chain, as stated by Professor Lesley and Dr. Frazer, consists of two groups of rocks, a quartzite and an orthofelsite series, the latter being considered the superior series. Mr. Walcott's investigations lead him to a different interpretation of the geologic structure of the mountain and the relations of the rocks composing it. He finds that the " orthofelsite " is in reality the lower series, and that the complicated structure of the mountain arises "partly from folding, but more largely from the westward thrusts of masses of strata along the lines of fault of a low hade. This westward thrusting on the fault plane, complicated by previous folding of the strata, leaves masses of the subjacent, pre-Paleozoic rocks resting in various places on different members of the Lower Cambrian series, and also appears to interbed the quartzites and schists of the Cambrian in the schists, eruptives, etc., of the Algonkian."

The following are the concluding remarks in the section on Correlation :

"The discovery of the Olenellus or Lower Cambrian fauna in the Reading sandstone practically completes the correlation of the South Mountain, Chickies and Reading quartzites, and establishes the correctness of the early correlations of McClure, Eaton, Emmons and Rogers. They all considered the basal quartzite as the same formation from Vermont to Tennessee; and the discoveries of recent years have proved that the basal sandstones of Alabama, Tennessee and Virginia (Chilhowee quartzite); Maryland, Pennsylvania and New Jersey (Reading quartzite); New York and Vermont (Bennington quartzite), were all deposited in Lower Cambrian time, and that they contain the characteristic Olenellus fauna throughout their geographic distribution. The superjacent limestones carry the Olenellus fauna in their lower portions in northern and southern Vermont, eastern New York, New Jersey and Pennsylvania. To the south of Pennsylvania the lower portions of the limestones appear to be represented by shales, and the Upper and Middle Cambrian faunas are found in the lower half of the Knox dolomite series of Tennessee, and they will probably be discovered in the same series in Virginia and Maryland when a thorough search is made for them. The same may be predicted, but with less assurance, for the northern belt of limestone crossing Pennsylvania into New Jersey as the limestones between the Olenellus zone and the Trenton zone represent the intervals of the Middle and Upper Cambrian and the Lower Ordovician, or the Calciferous and Chazy zones of the New York section."

Nothing was discovered upon which could be based a line of demarcation between the Cambrian and Ordovician linestones in the series under discussion. The division is still an open question to be decided by future revelations of lithologic and paleontologic characters. (Bull. U. S. Geol. Surv., No. 134, Washington, 1896.)

Structure of Uintacrinus.—Since Uintacrinus was first made known by Grinnell, some twenty years ago, little notice has been taken of the form. Of late, however, special interest in the type has been revived, and the form comes in for consideration in several important articles. Among them are W. B. Clark's review of the Mesozoic Echinodermata of the United States[1], in which all known material is described, and the structure amply illustrated by figures. Shortly after Williston and Hill[2] gave some "Notes on *Uintacrinus socialis*" as found in Kansas. Still more recently Bather[3] has gone over all the

[1] U. S. Geol. Sur., Bull. 97, pp. 21–24, 1893.

[2] Kansas Univ. Quarterly, Vol. III, pp. 19–21, 1894.

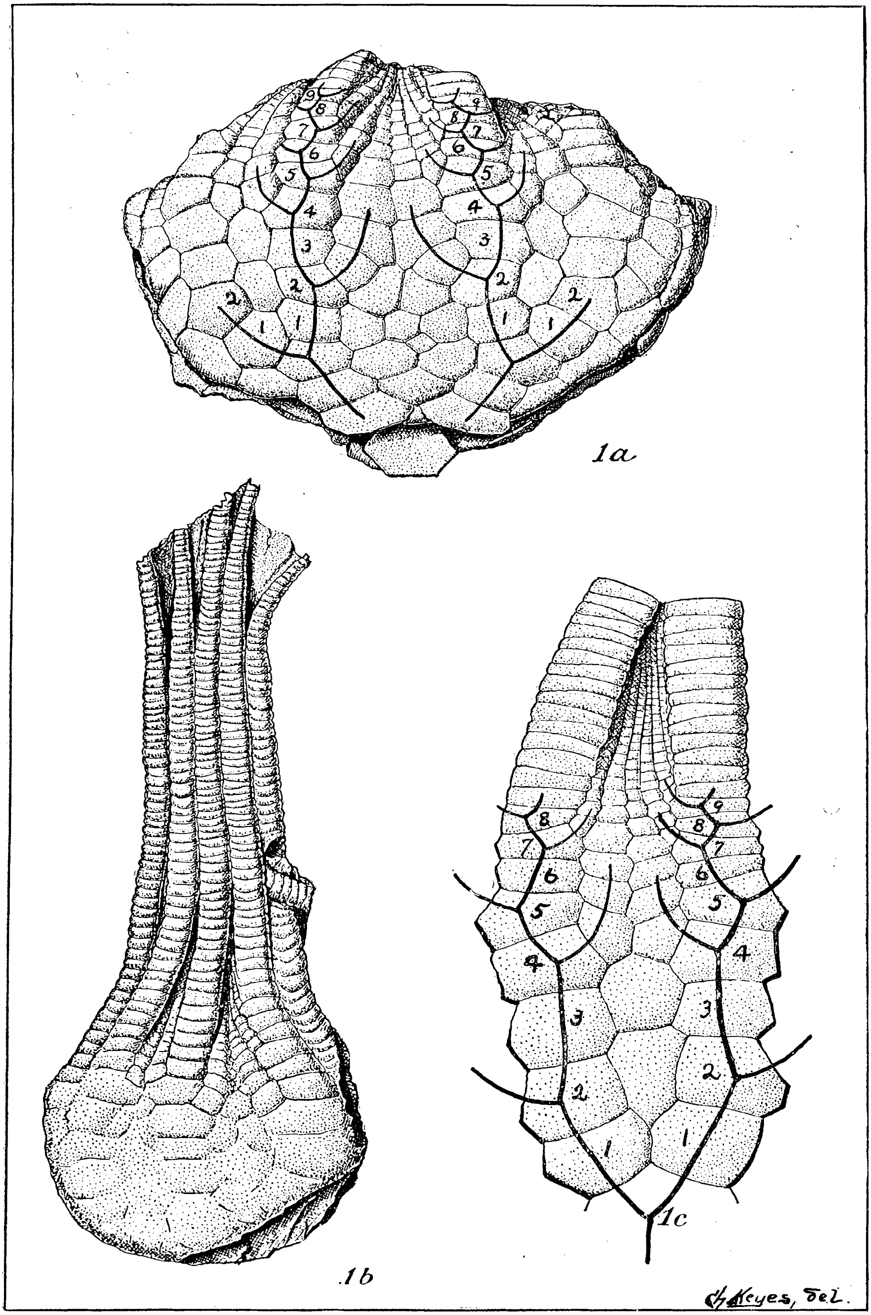
[3] Proc. Zool. Soc., London, 1895, pp. 974–1004, 1896.

available data, and has made the type of Uintacrinus the subject of a a special morphological study. In this treatment the previous work is briefly referred to; but some of it receives criticism that it does not appear to deserve, particularly since the foundation of most of the adverse comments lies not in any material error in the work referred to, but in what is manifestly a clear misinterpretation or hasty perusal of that work. It is to certain of these points in the structure of the form that attention is directed in the present note. In making the correction, however, it is not with the idea of reflecting on Mr. Bather's paper as a whole, for it is one of the most excellent contributions to echinoderm morphology that has yet appeared. The original figures in question from Bulletin 97 of the U. S. Geological Survey are herewith reproduced (Plate XV) in order to make more intelligible the exact points under consideration.

In the memoir mentioned considerable space is occupied in criticising a recent account of the species; but most, if not all of the objections urged against Doctor Clark's work, are certainly more imaginary than real. Professor Clark's figures come in for special condemnation as violating the fundamental law of the alternation of the pinnules. As a matter of fact his plate which is reproduced in the Proceedings as Plate LVI, to point out the alleged errors, not only shows that the accompanying statements are not true, but that in all three figures there is strict alternation of the pinnules in every case.

The general law in the pinnulation of the genus Mr. Bather states as follows: $IIBr_1$ none, $IIBr_2$ outer, $IIBr_3$ none, $IIBr_4$ inner, $IIBr_5$ outer, $IIBr_6$ none, $IIBr_7$ inner, $IIBr_8$ outer, $IIBr_9$ none. Two of his ten specimens differed from this general rule: one showing $IIBr_6$ inner, $IIBr_7$ none, $IIBr_8$ outer, $IIBr_9$ inner; and the other $IIBr_5$ none, $IIBr_6$ outer, IIB_7 inner, $IIBr_8$ none, $IIBr_9$ outer. He makes out the formula for the Clark figure 1a to be $IIBr_5$ outer, $IIBr_6$ none, $IIBr_7$ outer. The real formula for this is $IIBr_5$ outer, $IIBr_6$ inner, $IIBr_7$ outer, $IIBr_8$ inner, $IIBr_9$ outer. This appears clearly indicated in the figure, and Mr. Bather's statements that $IIBr_6$ has no pinnule is certainly a typographical error, for it cannot be that he mistook the rough, broken and highly raised edge of the brachial row of plates, with its deep shadow, for a suture line connecting with the first inside pinnule. The figure is of a somewhat crushed and distorted specimen, and the perspective is, perhaps, not as good as it might be. Whether or not it is the same as that figured by Meek (Bather's figure 2) is not known; but if the two are the same, the difference in the sketches are not very great nor radical, and certainly not as contradictory as Mr. Bather would have

PLATE XV.



C. R. Keyes, del.

Keyes on Uintacrinus.

us believe. The only real difference is that in Meek's figure there is above $IIBr_5$ a non-pinnulated brachial separating two pinnule-bearing arm-plates. The same extra plate is shown in figure 1c. The intercalation of a non-pinnulated plate of this kind is of common occurrence among crinoids, and should not excite any wonderment, let alone adverse criticism. In Uintacrinus this is of frequent occurrence, not only in different specimens but also in the different arms of the same individual. Mr. Bather himself shows that two out of the ten examples which he examined do not agree with his general formula. If his observations could have been extended it might have been found that one in three is just about the proportion of the individuals that do not agree in this respect. It might be added parenthetically that of 200 specimens of Uintacrinus that have been personally examined, fully one-half of them appear to vary in a similar way in the mode of pinnulation.

Granting then that Meek's original figure is correct in every detail and that figure 1a of Professor Clark's plate represents the same specimen, the differences are practically immaterial. Professor Clark's work not only does not violate the fundamental law of pinnulation but is essentially correct so far as typifying the species. The very object of adding an enlarged view of another specimen (figure 1c) was to make more clear the arrangement of the pinnules, since the convexity of the principal specimen and its distortion somewhat misrepresented these points. The same may be said of $IIBr_9$ in figure 1c. Usually from $IIBr_7$ on, the pinnules are turned in or are covered by the matrix if the specimen is not carefully cleaned, and consequently do not show from above. That $IIBr_9$ should be visible on one arm and not on another is not strange, and not necessarily incorrect.

Regarding Mr. B. H. Hill's diagram the formula given by Mr. Bather is probably correct for the figure; but, as he has stated, it is difficult to decide the question owing to the "rather peculiar mode of representation." It seems hardly possible that this diagram correctly represents the pinnulation of the specimen from which it was taken, and the entire disagreement of the corresponding plate faces when separated would further indicate that the figure is, as stated by Mr. Bather, "hopelessly incorrect," or illustrates a new species.—C. R. KEYES.

Geological News.—PALEOZOIC.—From data recently compiled, Prof. C. R. Keyes estimates the total maximum thickness of the Paleozoic rocks in the middle part of the central Mississippi basin, that is, in the neighborhood of the Missouri River, between Kansas City and the Iowa boundary, to be 3000 feet. This differs considerably from the earlier estimates. (Amer. Geol., 1896.)

Bulletins No. 6 and No. 7, (1895) and No. 8, (1896) of the Illinois State Museum of Natural History contain descriptions of new Paleozoic Echinodermata, by S. A. Miller and Wm. F. E. Gurley. One new family (Thalamocrinidæ) and five new genera (Sampsonocrinus, Emperocrinus, Shumardocrinus, Thalamocrinus, Indianocrinus) are defined. In all, 156 species are described and figured.

MESOZOIC.—According to F. H. Knowlton, the fossil flora of Yellowstone Park represents three distinct stages. The first, or older flora, from the acid rocks embraces 79 forms; the second, or intermediate flora, has 30 species; and the third, or younger flora, comprises 70 forms. The author refers the first stage division to the Ft. Union or lower Eocene; the second is regarded as Miocene, but older than the Auriferous Gravels; and the third is probably of the same age as the Auriferous Gravels of California, that is, Upper Miocene. (Amer. Journ. Sci., July, 1896.)

A new fossil plant, *Salvinia elliptica*, is described and figured by Prof. Hollick. The new species is from the Upper Cretaceous of Washington State. (Bull. Torrey Botan. Club, Vol. 21, 1894.)

BOTANY.[1]

Botany at Buffalo.—In August (21 to 28) there were three botanical meetings held in Buffalo, as follows:

The Botanical Society of America met on Friday and Saturday in the High School, with eleven members in attendance. C. H. Peck, of Albany, and B. T. Galloway, of Washington, were elected to membership. The question of the desirability of a winter meeting was discussed and referred to the Executive Committee. Appropriate resolutions regarding the death of M. S. Bebb, a member, were adopted. The address of the retiring President, William Trelease, on "Botanical Opportunity," was given in open session on Friday evening. This will be printed in full in *Science* and the *Botanical Gazette*, and will also be distributed in pamphlet form by the Secretary. The following papers were accepted for presentation:

The Philosophy of Species-making. By L. H. Bailey.

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[1] Edited by Prof. C. E. Bessey, University of Nebraska, Lincoln, Nebraska.